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SCHOOL AND SOCIETY

EDITED BY J. McKEEN CATTELL

Volume VIII SATURDAY, DECEMBER 21, 1918 Number 208

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THE SCIENCE PRESS

LANCASTER, PA. GARRISON, N. Y.

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SCHOOL AND SOCIETY

Volume VIII · SATURDAY, DECEMBER 21, 1918 · Number 208

THE GENERAL OR COMPOSITE INDUSTRIAL SCHOOL IN THE CITY OF LESS THAN TWENTY-FIVE THOUSAND POPULATION

THE provisions of the Smith-Hughes law authorize the establishment of a different type of industrial school in a city of less than twenty-five thousand from the unit trade school required as a type in cities of more than twenty-five thousand. We in the territory of the middle west, where small cities predominate, have been anxiously listening and watching for discussions bearing upon this composite industrial school, but have been listening and watching in vain. The interest so far seems to center almost exclusively in the unit trade schools of the larger cities. I am willing to grant that the problem is perhaps more urgent there, but I am not willing to grant that its solution there means more ultimately than its solution in the smaller cities.

In the upper Mississippi Valley states of Ohio, Indiana, Michigan, Wisconsin, Illinois, Missouri, Iowa, Minnesota, Kansas and Nebraska, there are 306 cities of population between 5,000 and 25,000, while there are but 68 cities of over 25,000. To secure the advantages of vocational training in trades and industries for the people of these 306 smaller cities is quite as important as to secure the vocational efficiency of the people of the 68 larger cities. The problem may be made more difficult by virtue of the fact that the communities are smaller, but we can not neglect the problem just because it is difficult.

The Smith-Hughes law provides separately for the giving of agricultural training. It provides also for home-making. But vocational efficiency outside of these two large fields is comprised in the classification, "trades and industries." I assume that the general provisions of the law are familiar to those interested in the problem. Let me remind you, however, that the composite industrial school with all-day sessions is only one of the three avenues open to vocational training in trades and industries in the smaller communities. There are, in addition to this, the part-time vocational schools or classes and evening schools or classes. The importance of these latter two types of training can not be overestimated and considerable attention has been rightly given to them from the beginning.

I am interested also in the all-day composite industrial school and I wish to bring to your attention what seem to me some of its richer possibilities, as well as some of the dangers which we must guard against in introducing it.

For some years this country has been recognizing more and more generally that our scheme of organization into the eight-year elementary school and the four-year secondary school fails to take into account one of the largest psychological factors involved in training children. We have in consequence been developing the organization of the six-year elementary school, three-year junior high school and three-year senior high school. One thing above all others has been demonstrating itself in this new organization, namely, that one of the chief, it not the chiefest, function of the junior high school is that it shall afford

boys and girls opportunity to familiarize themselves with a larger number of the aspects of industrial life as they find it around them. We call this work by various names but its function is understood to be two-fold, to give the youth whose preadolescent nature demands it a chance to see the world and a chance of finding himself in it. It is the foundation of vocational guidance and we take it for granted that almost all educators have agreed that the junior high school should somehow perform these two important functions.

With the development of the junior high school, educators have been appreciating more and more definitely that, as youth are enabled to find themselves and develop some rather fixed interests during the junior-high-school period, opportunities must be found for them to develop those fixed interests into efficient skills in the senior high school. We have not, however, had any corresponding development in the senior high school that has enabled us to accomplish this end. One of the largest possibilities then of the development of the composite industrial school seems to me to be that it fits logically with the already settled function of the junior high school. Boys and girls who have been enabled in the junior high school to explore their community thoroughly from the industrial point of view should have a place into which they can go after they have completed the junior high school and prepare themselves to fit into that industrial community. It seems to me therefore that the establishment of the composite industrial school will constitute first of all an enrichment of the senior high school as it is now established in most communities of less than twenty-five thousand. Along with the college preparatory course, the agricultural course, the home-making course, the commercial course, we shall have now the industrial course. We shall be just as free to equip thoroughly shops and laboratories for industrial training as we have been to equip physics laboratories for college preparatory training. We shall, of course, do better than we have been doing in the past the work in preparation for home-making, in preparation for farming, or in preparation for commercial pursuits, but at the same time we shall appreciate that it is just as significant to enable boys to become stone masons and girls to become dressmakers as it is to prepare boys to become farmers or girls to become bookkeepers.

There are three fundamental considerations which need to be kept in mind while we contemplate problems involved in the composite industrial school.

1. The fact that federal and state aid may be secured for the training of a certain type should not induce us as educators to sacrifice any sound educational principles in order to secure such aid. It should be borne in mind that any community can just as well afford to add the industrial school without state or federal aid as it can add the commercial or agricultural courses which have long been a part of good high schools. We should therefore develop the best industrial school that we can and make quite incidental the securing of federal or state aid therefor.

2. Vocational efficiency in trades and industries does not depend wholly upon the skill of hands nor the knowledge of the trade. There is no place in our social structure to-day that is in such danger of falling down as the industrial life where little else is regarded save the machine-like efficiency of the men and women on the job. Vocational efficiency in a democracy implies many other elements than are implied in an autocracy and in our plans for vocational efficiency we must not forget those

elements of citizenship upon which finally our institutions must stand or fall.

3. It must not be assumed that young people trained in the industrial school of city "X" are destined to remain in city "X" to any very large extent. We must remember that youth are free to move about from place to place and it should not be the ideal of vocational preparation to limit them in so doing.

There are three aspects of any educational institution which must be considered in order to get a fair picture of it and I wish to consider the three aspects of the industrial school, namely, its function, course of study, and its teachers, in the light of the three considerations given above. No elaborate discussion can well be given at this time. As a matter of fact no one would venture, I dare say, to state in much detail what is to be the future composite industrial school in the small city. There are certain aspects of the question, however, which seem reasonably clear.

THE FUNCTION OF THE COMPOSITE INDUSTRIAL SCHOOL

1. I appreciate the fact that those interested in the passage of the Smith-Hughes law had mainly in mind the specific trade training whereby men and women can be happier in their work. It is true, nevertheless, that the movement, begun a good many years ago, to incorporate in the educational opportunities of youth certain manual training, was based upon a perfectly sound psychological principle. Many boys and girls do learn, that is, do make mental growth, better by contact with things with which they work with their hands than they do in other ways. Educators have in the main bungled the manual training idea and have too largely formalized the work to get the greatest advantage out of manual training as an educational exercise. Nevertheless, to require that the industrial work be done upon a commercial basis will deformalize the procedures and give to us many of the main advantages which are known to be inherent in manual training. I would not be understood to mean that the function of the composite industrial school is the same as the function of manual training at its best. I mean, however, that among children above fourteen years of age—and they are the only ones who will be allowed to enroll in the industrial school—there has been altogether too little opportunity in the past in our secondary education for those who are motor-minded and who need constant contact with hand work to develop to their maximum mental stature. The first function, then, is to be broadly educational rather than narrowly vocational. Or perhaps better, to be vocational in the best sense the industrial school will be educative at the same time.

2. The function of the industrial school will not be attained unless it builds upon the foundation of vocational guidance erected in the junior high school. This requires that a rather wide range of industrial opportunities be opened to students, so that they may choose in the light of their vocational interests. It is not sufficient to offer a comprehensive course in any one of the various trades into which boys and girls may go. Instead it is necessary to offer the fundamental courses in a number of trades which appeal to different types of interests in the boys and girls who are members of the school.

3. The industrial school must never lose sight of its function to prepare for membership in a social group.

4. Finally, the function must certainly include the mastery of the elements of some specific trade, so that when a student has finished the industrial school, he is reason-

ably well qualified to step at once into some useful occupation. This does not mean that he must have been made a master workman nor does it mean that his entire period of apprenticeship may be eliminated, but it certainly does mean that he shall be able to shorten his period of apprenticeship and that he shall be able ultimately to go further in the trade than the young man or woman who has not taken such fundamental industrial training.

COURSE OF STUDY

To satisfy the functions set forth above, the course of study must have three types of work. (1) Shop instruction and practise; (2) instruction in related subjects, particularly the sciences, mathematics and drawing; (3) courses of a general nature to help men and women meet their responsibilities and enjoy the privileges of citizens in the community.

1. The essential characteristics of the shop work must be:

(*a*) The tools and machinery as well as the methods employed in using them ought to be such as prevail in the best commercial plants.

(*b*) Students should work upon a commercial output basis. Results of their labors must find their way into actual use. This suggests that it will probably be desirable in many cases that the shop be interpreted to mean industrial enterprises in the community itself whose operations may be supervised by the school.

(*c*) The amount of time devoted to shop work may vary. It should never be less than one fourth of the student's time and probably never more than one half of the student's time. The proportion of time in any case should be determined by how the larger aspects of vocational efficiency are best satisfied and not by the machinery of a fixed program.

2. In the related work so uniformly insisted upon in all the plans submitted under the Smith-Hughes law, we have what seems to me the best thing in modern education. When science finally won its way into the curricula of schools, it was the belief that science had a value not found in the study of languages and history. The public schools, particularly of America, have persisted in formalizing science instruction to such an extent that its values have become almost identical with the values of instruction in languages and history. Now, however, we have the demand which we shall not fail to heed that sciences and mathematics be motivated, that the problems which are raised in them have a significance comprehended by the students. This demand is of far-reaching importance and represents a bright day to those of us who have long contended that the study of applied science is better than the study of unapplied science even from a non-vocational point of view. Vocational education is now making this insistent demand and we shall soon see this principle given much wider application in all types of secondary education.

It is impossible for us to predict at this time just what this related technical work will consist of, but the end in view is so very clear that we shall not long fail to find the materials. If the boy is working in the foundry we shall soon learn the sort of physics and chemistry that will enable him better to understand what he is doing. We shall not be long in discovering what mathematics he needs to enable him to take the next step in his work. In fact, the boy himself will be the one who will determine for us largely the needed related work. The guiding principle of it all will be, whatever technical study is necessary to make more intelligible the processes of any trade will

be given the boy at the time when he feels their need most.

3. In addition to this shop study and practise and the study of the related work, which together need not take more than one half the student's time, we shall give courses of a general educational nature intended to make for citizenship. There seems little doubt that we shall have studies of a social-science nature, involving history, economics, sociology and civics, through which the students will be able to discover their obligations as well as their opportunities in citizenship. It seems equally clear also that in this part of the students' day, we shall have wide opportunities for them to prepare for their leisure time. It would seem that studies to develop an appreciation of music, literature and other arts should find a large place. Furthermore the development of a sufficient skill in some kind of sport, which will carry over into adult life and enable persons to take an interest in some kind of avocation which will provide healthful recreation of a physical sort, should be provided.

Thus the course of study made up of the shop practise, which will provide wide vocational opportunity and at the same time specific trade training in some special line, and the related work which will give a definitely motivated type of study, and the general courses comprising at least the social sciences, and certain arts to prepare for leisure, represents, as I see it, the work of the composite industrial school. I do not find anything in the law which will prevent receiving aid from the Smith-Hughes fund for such a school.

THE TEACHERS

From this brief outline of the industrial school it will be apparent at once that to find teachers for such work will not be an easy task. The teachers of shop work, it seems to me, should have as their first qualification trade efficiency. They must be masters of some trade or industrial work. They should in the second place have a wholesome point of view towards industrial problems and should appreciate keenly the fact that the industrial school is preparing citizen workers. As to what academic training it is necessary for such teachers to have, aside from an elementary education, I am not seriously concerned. The mixture of a few good clean workmen with our present high-school faculties would in many cases be an excellent thing, even if no questions were asked as to academic preparation of such teachers. On the other hand, we should be able ultimately to find those whose academic training is ample at the same time that they have the qualities above mentioned. The only specific thing that seems necessary in the way of educational training is that they appreciate the problems of teaching. They must realize that it is not the same to know the essential truths of a trade and to teach those truths. To give such pedagogical training to practical workmen is going to be a severe test upon teacher-training institutions. Such training must be given, however, and it will in my judgment exert a wholesome influence upon the institution when the task is undertaken.

The teachers of related subjects will need to be educators first of all. For them will be the task of reorganizing science into a series of problems related to the particular industries whose fundamentals are being taught in the shop. They will have the same task to perform with mathematics and to a lesser extent with drawing. It may be that many of our present teachers of science, mathematics and drawing, imbued as they are coming to be with the significance of proper motivation, may be able to undertake this readjustment of

materials. Long strides in that direction have already been made by certain educators in the production of science books which are organized primarily around problems vital in the experience of those who are studying. Whether our present corps of teachers do this service for us or whether a new group of teachers must be raised up for the task, teacher-training institutions must face this most important responsibility. Colleges which offer the advanced work in various sciences and mathematics fields for teachers will have to provide a somewhat different organization of their own materials in order that teachers pursuing their courses may be able to recognize this new significance of science and mathematics as applied subjects in solving industrial problems.

For teachers of the general subjects little need to be said at this time. What is good for the students in the industrial school in these particulars is also good for members of other departments of the secondary school and the demand is not more urgent in the one case than in the other. Social studies and art studies which really function in life are demanded everywhere and teachers are readjusting their work more or less rapidly to meet this responsibility.

If the Smith-Hughes law will enable us to get more quickly than we should otherwise have been able a school such as I have here described, it will prove in my judgment one of the greatest boons in modern education.

F. J. KELLY
DEAN OF SCHOOL OF EDUCATION,
UNIVERSITY OF KANSAS

WHAT SHOULD CONSTITUTE THE CURRICULUM OF THE JUNIOR COLLEGE OR EXTENDED HIGH SCHOOL?

THE development of junior colleges as an extension of public high schools has gained considerable momentum. But the curriculum seemingly has not been given adequate consideration. In many places the chief aim seems to have been to maintain a junior college just so as to appear progressive. The possibilities of service which such an organization may furnish and the responsibilities taken on seem not to have been adequately analyzed. Doubtless mature consideration would convince some conservative communities of their necessity of moving forward; similarly it would show other communities the unwisdom of appropriating the people's money for what would bring that community such meager returns.

In a somewhat extended investigation carried on about two years ago, a communication was sent to high school principals and city superintendents in about two hundred cities in various parts of the United States to discover the status of the junior college and the trend of best opinion on various questions relating to it. Among the questions asked were: "What subjects could be given best in the junior college course?" and "Should one year or two years of junior college work be attempted in the high school?" The returns brought quite a uniformity of replies. The traditional freshman and sophomore college subjects were most often mentioned. The distribution of the answers is given below. The numerals following each subject indicate the number of times that the subject was mentioned in the returns.

Agriculture 5, algebra 6, analytical geometry 2, anthropology 1, architecture 2, art metal work 1, biology 4, botany 6, calculus 1, chemistry 26, civics 2, commercial subjects 9, composition 1, drawing 6, economics 13, engineering 1, English 65, French 9, geometry 1, German 10, government 3, Greek 2, history 65, home economics 9, horticulture 1, industrial and manual arts 12, language 64, Latin 17, law 1, library sci-

ence 1, literature 8, mathematics 89, mechanical drawing 4, music 1, normal branches 8, nursing 1, physiography 1, physics 20, psychology 5, rhetoric 4, science 39, shop work 7, social science 14, Spanish 8, surveying 1, trigonometry 7, "usual college subjects" 36, vocational subjects 6, zoology 3.

Evidently most of the respondents were thinking of the extended high school almost solely as a truncated section of the traditional college. With that as an end in view the answers were perfectly logical. They show the too ready acceptance of college domination in the determination of local educational policies. The old cry of college domination was a perfectly proper one because high school curricula in subjects and topics within subjects have been altogether too much influenced by the colleges. But with the rapid spread of the accredited system that has been largely eliminated. Where it has not been completely eliminated the high schools have only themselves to blame. Doubtless the colleges and universities in establishing accredited relations with schools have more or less consciously regarded it as a means of attracting students to their particular institutions. But the advanced thinkers in the universities have urged it primarily because they have foreseen that the secondary schools would thereby attain a means of adjusting education to community and individual needs rather than shaping it solely on the recommendation of university authorities. To be sure even a majority of members of college faculties murmur at the "debased standards" but accept it as inevitable. They know that the state institutions that stand out against the current will be obliged to heed the wishes of the tax-payers or be replaced by others more alert to modern needs. The private institutions understand that those that refuse will be obliged to close their doors.

In view of this power of the secondary schools to determine their own policies should there not be a radical departure in the extended high school curriculum from the traditional college organization? The established private colleges which are forced by the onward march of education to reduce their institutions to junior colleges may well continue to be solely preparatory to the universities. But have not the local junior colleges, especially those supported by local taxation, an entirely different function? Should they not stand in much the same relation to the present organization that the rapidly developing night schools do? They should be open to all the adult population who can profit by the work offered. The courses offered should minister to the special needs of the given community.

Courses should be offered in English, foreign languages, college mathematics, sciences, public speaking, etc. In cases where the same subjects are offered in the regular high-school course students could take them in the regular classes and be given proportional credit. It would be better, however, if enough adults desire the work to give separate sections, requiring those who desire college credit to advance as rapidly as regular college classes and the work should be presented to them by methods adapted to advanced students. Even in a beginning course in language or science more philosophical view-points are naturally discussed with advanced students than with children.

In addition to the usual elementary college subjects, however, there should be courses in shop work, drafting, surveying, industrial chemistry, agriculture, horticulture, dairying, economics, political science, government, sociology, literature, music and art that will attract adults of the com-

munity. Most of these courses could be taken by well-read, intelligent men and women whether graduates from the high school or not. To understand them demands not so much technical prerequisites as breadth of experience and maturity of mind. Even the mathematical prerequisites for engineering subjects are vastly less than people have been led to believe. I have heard an expert university professor of engineering say that the algebra, geometry and trigonometry necessary for the study of most engineering branches could be taught to a person of ordinary intelligence in a few weeks.

Elementary psychology is another subject that should be included in every junior college curriculum. This should not be of the book-lesson-recitation type, but should be presented in entirely informal discussions reinforced by a wealth of concrete illustrations from personal experiences and observations. Even some of the striking experimental phenomena, such as illusions, habit formation, economical learning processes, etc., could be introduced. A teacher familiar with its applications to child study and the education of defective children could enlist the interest of large numbers of parents. If state aid were employed as a means of support university lecturers could be utilized in giving certain courses or parts of courses for which local teachers were not especially prepared.

Every bit of work in home economics that is ordinarily given in the first two years of a university course could be given just as advantageously in the local junior college. It should include courses in household chemistry, cooking, cleaning, laundering, dyeing, sewing, dressmaking, millinery, decoration and design. Art and music should also have their rightful place in the curriculum. Education in music and art both in the acquisition of appreciation and also of technical skill which may enable the learner to later acquire a livelihood should be furnished in every community at public expense. How can we justify teaching Latin and algebra to thousands of boys and girls which only the few ever use and not music which vastly larger proportions would use for the benefit of themselves and society all their lives? If these public junior colleges are to be supported by the taxation of all, then they must be broad enough in scope to offer something readily desired by all and not be limited to a few selected classes.

The state law of California in providing for the establishment of extended high schools was evidently framed by those who had in mind paralleling the traditional college course so as to enable worthy boys to secure a part of a college education at home, if unable to go away to secure it. That was, of course, a very laudable aim, but would hardly justify the establishment of the junior college. There must be some ministration which the local junior college can perform for the boys and girls and the community better than it can be performed by the remote institutions.

Commissioner Wood of California, who has made a very careful study of the junior college movement in California, gives expression to ideas which support this view. He writes:[1]

> Under provisions of the law, the courses of study in the junior college department must approximate those offered in the first two years at the university. This limitation should be removed so that the junior college department may become a self-directing institution, free to adapt itself to community needs. It is well, perhaps, that the junior college department, in its infancy, was under college tutelage, but the time for limitation of the work of the junior college has passed. There is need in various communities in the state for post-

[1] Report of the Commissioner of Secondary Schools, June 30, 1916, p. 24.

graduate courses of a vocational nature, including courses designed to fit students for civic occupations as advocated by Dean Alexis F. Lange of the School of Education at the University of California. In certain communities the junior college may offer courses in higher commercial law, business management, accounting, banking and finance. There is need also for the introduction of the study of Spanish and of Spanish-American history, customs and institutions, with a view to fit young men for commerce and trade in Spanish-American countries. For such students the study of literary Spanish is of doubtful worth.

In certain communities the junior college should offer courses in practical engineering—civil, structural, mechanical and electrical. They should give courses in plane surveying, strength of materials, hydraulics, architecture and bridge design. In other communities, advanced practical courses in agriculture may be offered. It is essential, therefore, that the law shall be so drafted that courses other than those approximating the first two years at the university may be offered.

Dean Lange, of the University of California, recognizes that the junior college must not be merely preliminary to the last two years of college if it is to fulfill its most important mission. He says:[2]

It is of course an inevitable phase of development that as yet not one of the junior colleges has fully found itself. But even now the uncertainty that exists relates rather to matters of organization and method than to fundamental conception and aim. It is coming to be generally understood that the junior college can not serve its complete purpose if it makes preparation for the university its primary object. For the great majority of junior-college students, courses of instruction and training are to be of a piece with what has preceded; they are to be culminal rather than basal. The junior college will function adequately only if its first concern is with those who will go no farther, if it meets local needs efficiently, if it turns many away from the university into vocations for which training has not hitherto been afforded by our school system. Hence it will of necessity be as nearly autonomous as its place in the public school system of the state permits; (*a*) departments designed to promote general social efficiency, (*b*) departments designed to furnish complete training for specific or vocational efficiency.

[2] "The Junior College of California," published as a University Bulletin, July, 1915, p. 8.

Lange says that the junior college in California has been developed out of the gradual upward extension of the existing high schools. It has been especially urged "in the educational interest of the great mass of high-school graduates who can not, will not, should not, become university students. Such extensions, it was urged, might and should make it possible for the small minority to enter a university, in the narrower sense, at the end of two years; but the controlling educational purpose should be to provide for a reasonably complete education, whether general or vocational."[3] One other impelling motive was the desire to provide additional facilities for vocational training for those who do not look toward the professions.

In Los Angeles we find an exemplification of this broad conception. In the junior college curriculum "there are college classes in English, Latin, Greek, German, French, Spanish, physics, chemistry, zoology, botany, agriculture, psychology, economics, Oriental history, English history, mathematics, logic and the fine arts. Students are prepared for the junior year in California and Stanford universities in the colleges of letters, social and natural sciences, agriculture, chemistry, engineering, art, law and medicine.

In extending the high school to cover two years of advanced work it is not expected to confine its scope to that of the traditional college. Opportunity may be offered for work of a local character along historical, scientific and industrial lines. For instance, in southern California intensive study and original investigation may be made in historical research in connection with the Spanish and Mexican occupation; in science, in the study of the plants and animals and geological formation of this region; in industry, in the problems of immi-

[3] "The Junior College," *Proc. N. E. A.*, 1915, p. 121.

gration and the local economic relations with the oriental nations with whom there will be increasing contact. The junior college ministers to the wants of a growing number of young men and women in the city who will not go to the university. In several instances, doctors, lawyers and teachers spare from their professional duties an hour or two daily for special study of culture subjects that had to be neglected when they were mastering the technical courses.''[4]

On the basis of the writer's study of the junior college the faculty committee on the junior college of the University of Washington adopted the following recommendations as a guide to the accrediting of junior colleges by the University of Washington:

1. All developments of the junior college in connection with public high schools should be determined by local initiative and in response to local needs rather than because of undue stimulus from the universities.

2. Universities should counsel communities to organize the work so as to minister to local needs rather than primarily to connect with university courses.

3. Preparation for senior college work should be incidental rather than the chief function of the local junior college.

4. All overtures looking toward accredited relations should emanate from the local junior college rather than from the university.

5. No work should be accredited without careful inspection by experts in school administration from the university.

6. Universities should be generous in the range of work accepted toward university entrance.

7. Universities should insist that any work accredited should be distinctly advanced in character beyond that given in the regular four year high school.

8. Quality of work and methods of presentation rather than particular subjects should be the determining factor in deciding accredited relations.

9. Accredited relations should be provisional for a probationary period.

10. Do not accredit on promises to secure adequate equipment and properly trained teachers. Better have a prolonged probationary period than dissatisfaction or ultimate severance of accredited relations.

11. The character of work done by students in pursuing higher work should be an important factor in determining permanent accredited relations.

12. Freshman and sophomore work in the state universities should never be abandoned. Parents in small communities have a right to insist that the state provide for their children advanced education from the point where the high school work ends. Pupils from small communities especially need the larger institution. One of the means of guarding against provincialism is to come in contact with the cosmopolitan student body which a university affords. The large city high school furnishes something of this and consequently pupils in these schools could remain in the local school a year or two longer better than could pupils from the smaller communities.

FREDERICK E. BOLTON
DEAN OF THE COLLEGE OF EDUCATION,
UNIVERSITY OF WASHINGTON

[4] ''An. Rep. Bd. of Ed.,'' 1914, pp. 202–205.

THE STUDENTS' ARMY TRAINING CORPS[1]

I UNDERSTAND that when the program was set up, an hour or so was set aside this

[1] Address by President Richard C. Maclaurin, of the Massachusetts Institute of Technology, national director of the S. A. T. C., at the meeting of the American University Association, December 5, at the Harvard Medical School.

afternoon for the discussion of the merits and demerits of the S. A. T. C. Great events have, however, intervened with the result that to-day the S. A. T. C. is practically at the end of its career. We are here to bury Cæsar, not to praise or blame him. It is suggested, however, that before performing this pious act we should look a little into his history and see what lessons can be learned from the brief record. In the middle of the summer when I was asked by the Secretary of War to accept the educational directorship of the S. A. T. C. the plan presented differed in many important respects from that which stress of circumstances made it necessary to adopt when the work was actually begun. The radical difference was that the first plan proposed to induct the students into the Army but then to place them on furlough status prescribing only a limited amount of drill and requiring a few hours per week to be devoted to the study of the so-called Allied Subjects. This plan would have interfered comparatively little with academic freedom and would, I expect, have avoided most of the educational difficulties that actually presented themselves later. Circumstances, however, made its adoption impossible, the main factors in the change being two: first, the passage of the man-power bill, and second, and far more important, the publication simultaneously with the passage of that bill, of the plan to have four or five million men in Europe by the first of July. Under the changed conditions the law advisers of the War Department advised the Secretary of War that the plan of putting the students on furlough status was illegal, and to overcome this and various other difficulties that were presented, it was decided to place the men on active status and this had as necessary consequences the furnishing of barracks, subsistence and tuition and the payment of thirty dollars a month to each soldier. Before this change of plan was made, tentative regulations had been drawn up and these regulations having been presented to representatives of the colleges and universities of the land met with almost universal approval. Military instruction and discipline were to be in the hands of a military officer and this officer was to have the same relations to the president of the college as a member of its faculty. That scheme was devised, of course, to overcome the obvious difficulties of dual control, but the change to active status was held by the military authorities to necessitate a change in the relations between the commanding officer and the president and this change had, as all of us who were associated with educational institutions predicted, many unfortunate consequences. Apart from this, however, the announcement of the policy of the authorities to transport an army of four or five millions to Europe by July first could not but affect, and profoundly affect, the plans of the S. A. T. C. As these student soldiers could not be in any way privileged, they must be drawn into direct service at about the same time as those soldiers of similar age who were not in the colleges. This necessitated the rule about the division of the college students into three groups arranged with reference to their age—those of twenty years of age, those of nineteen, and those of eighteen—and the corresponding regulations regarding the courses to be pursued by these different groups. The difficulties inherent in this situation were recognized by every one who appreciated them to be extremely formidable, but there were, as you know, various special circumstances that greatly increased the inherent difficulties. Much the most serious of these was the epidemic of influenza and pneumonia which swept across the country and struck practically all the colleges most inopportunely either

just as they were about to begin their work or within a week or two after they had begun it. This epidemic not only left a trail of discomfort and woe, but led to further delays. The process of induction which should have been completed at the very beginning of the term dragged over for a month or so, the process being greatly prolonged by the failure of the local boards to return the necessary papers quickly. Simultaneously with these troubles came those consequent on the breakdown in the Quartermaster's Department and the consequent failure of supplies of uniforms, bedding and the like. None of these difficulties had anything whatever to do with education, but that side of the work was not free from trouble. Plans had been carefully laid for a system of education that was consistent with the scheme approved by the authorities before the passage of the man-power bill, and the change of plans necessitated radical changes at the very last moment when most of the colleges had either already begun or were just about to begin. Further to complicate the difficulties, authority to spend money on publications was withheld until a time when most of the colleges naturally expected to be well under way. I have gone over these matters because some of them may be new to some of you, but you all know that through various causes the S. A. T. C. was scarcely launched before its need was happily removed by the signing of the armistice.

If you bear all the circumstances in mind I do not see how you can come to any other conclusion that that there is little or nothing to be derived from the experiences of the S. A. T. C. that can throw any light on what should be the permanent policy of the country regarding the relations between military and academic training. The conditions under which it worked were all exceptional and all abnormal. The whole condition of the country was not more abnormal than was that of the minds of the students and to a lesser extent of the faculties. Amongst the few phenomena possibly worth recording are the following: first, the self-sacrificing spirit of practically all who gave themselves to the task of directing this effort; second, the thoroughly good intentions of practically all the Army officers, combined in a few cases, it must be admitted, with almost complete lack of appreciation of the difficulties of the problems as presented to the academic mind; third, the individualistic outlook of many, although not all, of the colleges and their difficulty in spite of good intentions of recognizing the military exigencies of the situation. However, do not let us commit the mistake of glibly making generalizations as to the result of S. A. T. C. experiences. Some college presidents are quoted as saying that the experience has proved that military and academic training can not go together, apparently forgetful of the fact that they have gone together with rather conspicuous success in many of the military and naval academies of the world. I am not suggesting, of course, for a moment that the combination of military and academic training such as is to be found at West Point or Annapolis is either necessary or desirable in the colleges and universities of this country. All that the experience of the S. A. T. C. proved was what any one would have expected—that such a combination could not produce satisfactory results in a few weeks, that it requires time and patience to overcome the difficulties inherent in it and a great deal more careful planning and arrangement of details within each college than was practicable in the very few weeks during which the S. A. T. C. was actually operating. Reports came in from all quarters that difficulties were being overcome and that particularly in

the smaller colleges things were beginning to go well, and I have no doubt that with the general good-will and cooperative spirit that prevailed, most of the difficulties would have shortly disappeared. However, all this seems to me rather beside the mark if we are considering the future, for in the future, of course, except in case of actual war, we must have far greater academic freedom and far less military control—something much more nearly approaching the system that has prevailed for more than half a century in the Land Grant Colleges, with the possibility, I hope, of a more intensive military training in camps during the summer. The provision of work in summer camps would present some special difficulties to technical students but the problem of these students is special anyway and would call for special treatment. It should never be permitted to happen again that the country be called upon suddenly to provide a large army of technical experts for the needs of war. If we are optimistic enough to believe that war is to be abolished then there is no problem for us to discuss to-day, but if war is to remain a possibility we must face the fact that it would tend more and more to be a war of applied science and the nation that does not take that lesson to heart by training men to apply science to war-like ends should necessity demand such an application would surely go down in the next great conflict.

RICHARD C. MACLAURIN

EDUCATIONAL EVENTS

EGYPTIAN SCHOOLS

THE Cairo correspondent of the London *Times* reports that something of a sensation has been created by the publication of the report of the results of the government secondary certificate examinations. Mr. Boyd Carpenter, the senior inspector of the Ministry of Education, who signs the report, frankly regards the results as a catastrophe. In the higher division, where only 35 per cent. of the candidates passed, the candidates showed narrowness of outlook, ignorance of contemporary events, a lack of general knowledge, and a total absence of interest. This is extremely deplorable when one considers that the average age of the candidates is 21. In the lower division, of 5,192 candidates, only 19 per cent. passed. The real cause of these failures is the fact that many of the candidates were in a quite unprepared condition.

The root of the evil in both divisions, Mr. Carpenter thinks, lies in a general failure to exercise common sense, the absence of reasoning power, the dull repetition of memorized facts and data, and the want of interest and practical intelligence shown by the candidates, the largest proportion of whom come from state-inspected schools. Especially marked is the fall off in the standard of English, which is apparently regarded as a dead language by most of the students. A contributory cause of the general deterioration has been the serious derangement of school routine as a result of the emergency measures necessitated by the war; nevertheless, the whole report, which was an attempt to bring home the seriousness of the situation, not only to the authorities, but also to the people, constitutes a strong indictment of the educational system existing here.

At the same time, the indictment is as much against the mental equipment and intellectual apathy of the youth of Egypt as against the general educational system. Whilst, naturally, little can be done to change this in respect of the mass of candidates, yet there undoubtedly exists an element, albeit small, which possesses intellectual qualifications capable of development. The remedy seems to lie in the closer coordination of state and private schools (the latter are often run by entirely unqualified persons), the complete control of the non-state teaching staff, more effective inspection, and the penalizing of any non-state school which repeatedly sends up candidates in an

unprepared state. In order to bring all this about, a considerable strengthening of the English side of the ministerial staff is said to be inevitable.

THE SCHOOL OF EDUCATION OF BOSTON UNIVERSITY

ON November 16, the enrollment in the newly established school of education of Boston University was 127. Most of these students were registered for full-time work, and nearly all of them would not have gone into the university had not the new school provided a way for them.

The school of education has three departments of work: Public School Education, with Professor Arthur H. Wilde at its head; the Department of Religious Education, under the headship of Dr. Norman E. Richardson; the Department of Missions, Social Service and Church Work, under Professor W. S. Athearn, with Dr. Arthur E. Bennett associated with him. Thus far the Department of Missions, Social Service and Church Work leads in the registration of students, many of these having come from the school of the New England Deaconess Association, which school is now merged with the School of Education.

The bachelor's degree offered by the school, "B.E." (Bachelor of Education), rests in general upon two years of cultural and intensive study, supplementing two other years of more general or professional study in a standard normal school or college. It is more elastic in its requirements for admission to collegiate standing than is either the A.B. or B.S., and for a diploma of the school fuller credit than heretofore is allowed for successful study in normal schools. Somewhat less than two full years of college credit is allowed for the two years of the standard normal course, and to finish the degree course in two additional years the student must pursue a heavy program of varied character.

The candidate for the B.E. degree must complete major and minor work in two departments, one of these being education (but if education is offered as a major, the candidate must take another major in another field); ten semester hours in English; ten semester hours in foreign language; twelve hours in social science, history, economics, or sociology; six hours in general and applied psychology; eight hours in laboratory science.

The new degree of Bachelor of Education has been recognized by the State Board of Education through its agent for high schools, and by the Board of Superintendents of the Boston schools. There has been a cordial expression of interest and appreciation from these offices of the effort being made by the university to train teachers for larger usefulness.

An excellent library of books, charts and illustrative material in various fields of education has been secured either by gift or by purchase, mostly through the activity of Professor Athearn. Material will be kept on exhibit for suggestion to teachers and administrative officers.

In the second semester of the school several new courses will be offered by Professor Blanpied and Mr. John L. Alexander. The former's courses will be in the field of sociology, the studies comprising intensive surveys of social conditions in New England, social statistics, the Americanization of the immigrant, and home missions. Mr. Alexander will lecture on religious education.

A WOODROW WILSON CHAIR OF INTERNATIONAL POLITICS

MAJOR DAVID DAVIES, M.P., and his sisters, have given $100,000 to found a chair of international politics at Aberystwith to be associated with the name of President Wilson. The letter to the president of the university reads in part:

> Beyond all material reparation and all territorial adjustments, the foundation of a righteous peace among civilized states may prove to be the most permanent and most valuable result of the war. Plenipotentiaries at the Peace Conference can lay the foundations of a league of free peoples, but they can not rear a temple of peace. That is the task of the coming generation, and for its achievement we shall need consecrated energy, goodwill, knowledge and enlightened public opinion in all countries.

Old problems must be confronted in a new spirit; insular and vested prejudices must be removed; understanding and toleration need to be greatly developed. It is an immense task, and a myriad agencies will be required to discharge it.

Among these must be our universities. It has occurred to my sisters and myself that the University of Wales and the Council of the College may be willing to allow us to found a chair of international politics at Aberystwith in memory of the fallen students of our university, for the study of those related problems of law and politics, of ethics and economics, which are raised by the project of a League of Nations, and for the encouragement of a truer understanding of civilizations other than our own. We are prepared to contribute for this object the sum of £20,000, and we should be glad, if our proposal is accepted, that the chair should be associated with the illustrious name of President Wilson.

ANDREW DIXON WHITE

THE trustees of Cornell University have adopted the following minute:

The members of the board of trustees of Cornell University come to this meeting with an abiding sense of sorrow upon the death of their late associate, Andrew D. White. Dear in memory as the first president and constant friend and benefactor of the university; rich in the just fame of honorable public service; crowned with the laurels of scholastic dignities; Dr. White died when his work was done and the measure of his years was full. His life was precious not merely to Cornell but to all mankind. Its great events are a part of the nation's history and need no encomium here to augment their proper consequence. Its daily round of customary cares was traveled with dignity, patience, gentleness and kindness.

Publicist, statesman and diplomat, uniting a rare and graceful general knowledge with profound historical scholarship, he stands unique in the breadth of his sympathies and the range of his accomplishments.

With Carlyle he believed that "great men, taken up in any way, are profitable company." A wonderful power of observation and narration, coupled with unusual intimate relationships with the leaders of thought and action of his age, made him the most inspiring and least didactic of teachers.

His unerring instinct for the discovery and development of genius and learning opened the door of opportunity to the ambitious student and his clear visualization of the historic past aroused even the sluggard to an understanding of the symbols of art and literature about him.

In the days of bitter antagonism between dogmatic theology and the scientific view of the universe he was a brave soldier in the liberation war of humanity. Misunderstood and abused, he did not falter in maintaining his thesis that there could be no conflict between untrammeled scientific investigation and true religion. Cornell's noble buildings and equipment, its liberal and practical principles, now generaly adopted in other institutions of learning to their great gain not only as regards morals but also as regards religion in its highest and best sense, points to the triumph of ideas scarcely half a century old over time-honored conventions and prejudices.

A man of convictions, he thought that one was little worth who had not strength and decision of character, but for narow obstinacy based on half truths he had scant regard.

An enemy of untruth, injustice and unreason, his was the will and power to mould an enlightened public opinion to sustain liberty under the law by means of a sober faith in republican institutions.

Dr. White is dead. We have "followed among the sad, in the procession of sorrow, his hearse." But the university that he helped to found, the college that he brought together, the volumes that he wrote, live after him and "the light of his great example shines on the lives of men."

EDUCATIONAL NOTES AND NEWS

THE American Association for the Advancement of Science and about twenty affiliated national scientific societies meet in Baltimore during Christmas week, nearly all meetings being held on Thursday, Friday and Saturday. Dr. John M. Coulter, professor of botany in the University of Chicago, is president of the association. The retiring president, Dr. Theodore W. Richards, professor of chemistry in Harvard University, gives the address on "Conservation of the world's resources." Dr. S. A. Courtis, of Detroit, is chairman of the Section of Education, Dr. Franklin E. Buchner, director of the school of education of the Johns Hopkins University, the retiring chairman, gives the address on "Scientific contributions of the educational survey."

THE American Association of University Professors holds its annual meeting at the Johns Hopkins University on December 27 and 28. Professor John M. Coulter is president of the association as well as of the American Association for the Advancement of Science. The association will give special attention to college and university work under conditions of reconstruction. There will also be reports of the committees on systems of pensions and insurance for university teachers, reorganization and conduct of summer schools, apparatus for productive scholarship and other subjects.

DR. FLAVEL S. LUTHER, for the past fourteen years president of Trinity College, has tendered his resignation to the trustees and asked that it take effect at the close of the present college year. His letter to the trustees says in part: "At the next commencement season I shall be well along in my seventieth year. I can not hope much longer to be able to discharge with any satisfaction the onerous duties inherent to the office to which you elected me in the spring of 1904. For several years past I have been incapable of the activity necessary to the successful prosecution of my appropriate work. The present is a singularly opportune moment for a change in administration. All things are to be rebuilt on new lines and many old things are to be abandoned. I therefore tender my resignation to take effect, if you please, July 1, 1919."

HERMON CAREY BUMPUS, president of Tufts since September, 1914, has resigned and his resignation has been accepted by the trustees of the college. Dr. Bumpus will not necessarily leave the college at once, but it is his wish that a successor be elected as soon as possible, and certainly before the opening of the new academic year next September. Dr. Bumpus has been professor of comparative anatomy at Brown University, director of the American Museum of Natural History and business manager of the University of Wisconsin.

LORD COWDRAY has been elected rector of the University of Aberdeen in succession to Mr. Churchill, who has occupied the position for the last four years.

PROFESSOR PAUL SHOREY, of the University of Chicago, has been elected a member of the American Academy of Arts and Letters to fill the vacancy caused by the death of Andrew D. White.

RAYMOND DODGE, professor of psychology in Wesleyan University, has been made lieutenant commander in the United States Navy, in recognition of the special psychological tests devised by him for the use of the Navy during the war.

DR. HENRY CHURCHILL KING, president of Oberlin College, now on leave of absence in France, has succeeded Bishop Luther B. Wilson as head of the religious department of the Y. M. C. A. in France.

PRESIDENT HENRY NOBLE MACCRACKEN, of Vassar College, has resigned as national director of the bureau of junior membership of the American Red Cross.

DEAN HAYWARD, of the Agricultural Department of Delaware College, has been given a leave of absence for a year to serve as a regional director of agricultural education in France, under the Y. M. C. A. army overseas educational commission.

DR. WILLIAM H. HOLMES, superintendent of the schools of Mount Vernon, N. Y., has been selected as one of eight educational leaders to go to France to aid in the reconstruction work. Dr. Holmes has sailed, having been granted leave of absence by the Board of Education. Hugh H. Stewart, principal of the Industrial Arts School has been elected to be acting superintendent.

GEORGE H. JENSEN, director of the teacher-training course in trades and industry at the University of Washington, has been appointed district representative of education and training for the Industrial Relations Group of the Emergency Fleet Corporation, giving half of his time to this work and half to the university.

MISS CLEO MURTLAND, principal of the Trade School for Girls, Philadelphia, and for

three years assistant secretary of the National Society for the Promotion of Industrial Education has been appointed associate professor of industrial education in the University of Michigan. Miss Murtland's work will include training and supervision of teachers of women's trades and industries with such investigations as may be necessary in this connection. Her headquarters will be in Detroit but she will also conduct courses in other cities of the state. A feature of her work will be courses in connection with the summer school of the University of Michigan.

MR. EDWARD C. JOHNSON, dean of the Division of College Extension of the Kansas State Agricultural College, has resigned to accept the position of dean of the College of Agriculture and director of the Experiment Station, Washington State College, Pullman, Washington. He will assume his duties there on January 1.

C. R. SCROGGIE, owner and editor of the *Midland Schools*, has transferred the journal to the Iowa State Teachers' Association.

"GERMAN Education" was the subject of a lecture given by Professor Paul H. Hanus, of Harvard University, in the auditorium of the Massachusetts State House on December 11, under the auspices of the Massachusetts State Board of Education.

AT the sixteenth annual meeting of the Association of Teachers of Mathematics in New England, held at the College of Liberal Arts at Boston University on December 7, officers were chosen as follows: President, Professor William R. Ransom, of Tufts College; vice-president, Edmund D. Searls, of the New Bedford High School; treasurer (reelected), Harold B. Garland, of the High School of Commerce of Boston; members of the council for three years: Miss Alice M. Lord, of the Portland High School, and Charles E. Heigler, of the Wentworth Institute, Boston. Addresses by Dr. Payson Smith, Massachusetts Commissioner of Education, on "The place of the specialist in education," and Professor David Eugene Smith, of Columbia University, on "The introductory stages of algebra and geometry."

THE trustees of Cornell University have refused to adopt the recommendation of the class of 1873 that the university revoke degrees granted to Dr. David Starr Jordan because of his attitude toward the war. The statement by the trustees follows:

> *Resolved*, That, without entering upon a consideration of the merits of the charges made against David Starr Jordan, and even assuming that upon a broad construction it is within the power of the board to revoke his degrees after a lapse of more than forty years, it is unwise to establish an extraordinary precedent by attempting to take such action for causes which are not alleged to enter into his connection with the university or to impair the consideration upon which his degrees were granted.

DR. SIDNEY AUGUSTUS NORTON, emeritus professor of chemistry at Ohio State University since 1895, has died at his home in Columbus, aged eighty-four years. He was one of the five members of the original university faculty appointed in 1873, of whom two—Dr. Tuttle, of Virginia, and Dr. Mendenhall, of Ravenna—now survive.

THE Board of Trustees of the Utah Agricultural College estalished on December 2 an agricultural engineering experiment station as an integral part of that institution. Under the plan of organization there will be five experimental divisions of the new station under the following personnel: Irrigation and Drainage—Dr. F. S. Harris and Professor O. W. Israelsen; Roads—Professor Wm. Peterson and Ray B. West. Farm Machinery and Transportation—Professor L. R. Humphreys; Manufacture of Agricultural Products—Dr. M. C. Merrill and Professor J. C. Thomas; Rural Architecture and Buildings—Professor R. B. West.

JOSEPH R. DE LAMAR has left the residue of his large estate to be divided between the medical schools of Harvard, Columbia and Johns Hopkins Universities. The amount is estimated at $10,000,000 with an equal sum in case his daughter leaves no direct heirs.

THE Pennsylvania Training School for Feebleminded Children eventually will receive $5,000 for the maintenance of a scholarship from the estate of the late Benjamin H. Smith.

THE Fourteenth National Conference on Child Labor at its meeting on December 7 passed the following resolution:

WHEREAS, There has been introduced into the Senate of the United States a bill known as Senate bill No. 4987; and

WHEREAS, This bill, if enacted into law, will create a federal department of education with a secretary of cabinet rank, and will also appropriate annually the sum of $100,000,000 to be distributed among the states for the improvement of public education; and

WHEREAS, This bill, if enacted into law, will correct many of the evils and inequities now involved in the almost exclusive support of public schools by state and local taxation, and will furthermore recognize in a substantial and effective way the clear relation that exists between public education and our national life, and the fundamental significance of the public schools to the welfare and progress of a great democracy; therefore be it

Resolved, That this meeting urgently request Congress to give its approval to this important measure.

THE British Labor Party at its meeting on November 14 at the Royal Albert Hall to open the election campaign of the party adopted the program drawn up by its executive committee. Of the twenty demands contained in the manifesto one deals with education, and runs as follows: "A national system of education, free and effectively open to all persons, irrespective of their means, from the nursery school to the university; based on the principle of extending to persons of all ages, without distinction of class or wealth and without any taint of militarism, genuine opportunities for the most effective education on a broad and liberal basis, and the provision for teachers of all kinds and grades of salaries, pensions, training and opportunities of advancement commensurate with the high social importance of their calling."

THE students of the University of Porto Rico have presented a petition to the legislature asking it to amend the memorial to President Wilson and the American Congress so as to demand complete independence as the only status compatible with the ideals and interests of Porto Rico. Most of the petitioners were mustered out of the Students' Army Training Corps and represent some of the most prominent families of the island. One, Antonio Barcelo, Jr., is the son of the Unionist president of the Senate. The petition states that the action of the students is based on President Wilson's speeches promising self-determination to small nations.

IT is stated in *School Life* that several states have recently prepared educational bills to be introduced in the forthcoming legislatures or to be voted on at special elections. A notable example of the latter kind is the article on education contained in the proposed new constitution to be voted on by the people of Arkansas at a special election in December. This constitution, if adopted, will greatly advance the educational interests of the state.

IN West Virginia a state commission has drawn up a school code to be presented to the incoming legislature. This code is intended to remedy prevailing educational inequalities, particularly in school taxation, from which the schools of the state are suffering. If enacted into law the bill will advance educational matters in the state greatly.

IN South Dakota the State Teachers' Association has organized a strong legislative committee to cooperate with other committees composed of farmers' and business men's clubs, women's clubs, and others, to advance the interests of education with the next legislature. The survey commission which recently made an educational study of the state, under the direction of the Bureau of Education, hopes in this way to see enacted into law the important recommendations for reorganization made by the survey experts.

OVER 100 Kitchener scholarships have now been awarded in England. The receipts of the fund amount to £496,000.

NEGOTIATIONS are now under way for the establishment of a pre-nursing course in the

Municipal University at Akron, Ohio, to be carried on intensively for twelve weeks, beginning about January 1. The course, as offered, will give entrance to the Army School of Nursing and will prepare for work in army and civilian hospitals. It is proposed that students for these courses shall be recruited by the college women of the country under the direction of the Association of Collegiate Alumnæ. The new cooperative arrangements between the university and the Akron Board of Health, under the direction of Professor A. B. Plowman, of the department of biology, will be useful in arranging facilities and providing for instructors for the proposed course.

THE Mennonite settlers in Alberta, Canada, are to have schools established for their benefit immediately. Eight school districts will be organized and it is intended to have schools in operation during the early winter. The handling of the situation has been facilitated considerably by the appointment of the inspector for each district as an official trustee, and the erection of schools, engagement of teachers, and other details will be under his direction. The Mennonites have been given to understand that no exceptions will be made for them, but that they are to have schools under precisely the same conditions as English, French or Canadian people. All the teachers are to be fully qualified, and no teacher will be allowed to teach on the permit system.

DISCUSSION AND CORRESPONDENCE

FREEDOM FOR THE SCHOOL

EDUCATORS like to flatter themselves with the belief that through the schools they control the current of human thought, and that through their work they can make and unmake the ideals for which mankind is striving.

The history of education does not countenance this view. Systems of education reflect cultural currents, they do not create them; and the educator who believes that he himself is developing new ideals merely impresses the thought of his time upon the growing generation. For this reason the school is more often a conservative agency that crystallizes and emphasizes cultural currents than a creator of new ideas. The larger the school system, the more this is true. An individual who controls a school may impress his own personality upon it, but the schools of a large social unit, which are controlled by governmental agencies, reflect the status of the society to which they belong and its ideals.

True education should free the mind of the young of the shackles of unthinking conservatism and willing subordination to tradition. It should endeavor to develop independent thought, albeit tempered by the modesty engendered by the knowledge of our own limitations. Therefore it must be one of its fundamental problems to safeguard the young against the danger of being brought under the sway of a single dominant idea, which, however potent, has only temporary and local applicability. In such subjection lies the retarding influence of education regulated by religious agencies; in it lies the danger of state-controlled education and of the endeavors to make the schools conform to the public opinion of the day.

This condition is particularly clear at the present time when aggressive nationalism as against internationalism is demanded as the back ground of school-teaching; or when present governmental principles are set up as ideals to be worshipped, not understood, as against forms of government of the past, or against those that we see emerging and that may become the forms of the future.

It should be one of the fundamental tasks of education to teach the coming generation to examine coldly and dispassionately problems which are amenable to rational discussion but which are liable to be obfuscated by being accompanied by intense emotional feelings. It may be that the conscious suppression of the emotional excitement that is deliberately cultivated in our schools would make it less easy to arouse mass action by bringing into play those ideas around which the emotional excitement clusters; but against this loss of power

must be set the gain obtained through the possibility of intelligent discussion and action.

In the schools controlled by organized society, particularly by state or church, the governing body is always liable,—if not bound,—to scrutinize the orthodoxy of the teacher in all matters that seem to demand the development of unthinking emotional devotion. It does not mater whether this orthodoxy relates to matters religious, political, economic or to those belonging to other manifestations of social life. In all of them, the demand is made that the teacher must be unflinchingly devoted to those dogmatic principles that control the social body,—and the more so, the stronger the emotional tone of the dogma.

The conventionalism and lack of independence of the educated classess is largely due to their subjection to an education of this type. During twenty years of formal education, young people are held under this emotional control. It is reinforced by the conventionalism of the society in which they move. It is no wonder that after this time, they are no longer conscious of the dogmatic character of their opinions and consider as absolute truth ideals that are valid only if certain premises are accepted.

It can not be denied that it is a beautiful spectacle to see a whole people imbued with the same idea and developing such enthusiastic love for it that no labor and no sacrifice seem too great to attain its realization; but what if the ideal is based on error, when it means suppression of freedom of thought and action and injustice to those who hold other ideals? Is it not safer to cultivate freedom of critical thought and sacrifice the elemental power of mass-action to the freedom of the individual?

If we are true to our belief in individual freedom, than there can be no doubt as to our choice. We should banish emotional dogmatism and endeavor to give mental freedom to the young. No matter how hard we may try, it will never be given to all to think clearly and to free themselves of prejudice determined by personal likes and dislikes; but by making clear the way to freedom of thought, we can help the strong to attain freedom, the weak at least to understand its meaning.

The policy that will be most helpful for the attainment of these ends must be founded on the freedom of the teacher from control of his opinions, so that there may be an opportunity for the young to receive impressions from different points of view. This freedom is the only air in which the teacher can breathe who loves his charges and who is devoted to his great and responsible task. For the "educated classes" a more profound teaching of history will be most helpful, not of the kind intended to extol one particular people or state, but one that attempts to elucidate the dominant ideas that have determined the actions of states, churches and peoples. The wider and more diversified the field of view, the clearer will become the intelligent understanding of the dependence of our mode of thought upon historical tradition, the greater will be the tolerance of foreign forms of thought and the readier will be the mind to attack by intelligent thought, not by blind passion, the problems that confront our generation.

FRANZ BOAS

QUOTATIONS

SCHOOL ADMINISTRATION AND TEACHERS

SCHOOL administration in the United States has changed vastly in the last generation as a result of the growth of the superintendency as the chief executive office in city, county and state school systems. With the widening of the superintendent's power and responsibility has come a readjustment of the school board's function until the latter has relinquished much of its administrative and judicial work and has retained in its entirety only its legislative duties and its general veto control over educational policies. The results have been entirely to the advantage of the schools because they enjoy now as never before continuity in administration, and a form of executive service that is based upon sound principles of fact and theory.

In this evolution the classroom teacher has had little share so far as her own standing

is concerned. In fact, her influence on the shaping of policies and aims, as well as practical methods, has been almost nil. In some respects the entire tendency of these recent changes in school administration has been away from cooperation of teachers with superintendent and school boards. In spots there has been an insistence on the power of the superintendent which has arisen from warped notions of the supremacy of the expert and which has been a small counterfeit of the aristocratic theory of government.

That teachers have chafed under a system, which Dr. W. C. Bagley rightly calls the factory plan of administration, is evidence in the changes which have been going on in teachers' associations. The campaigns waged by teachers in a number of large cities can not be interpreted as simple fights for higher wages and a more secure tenure of office, but rather as a demand for recognition of the teacher in the conduct of the schools and for greater democracy in administration. Some superintendents of foresight have recognized the value and the necessity of the teacher by arranging for councils or committees of instructors so that the latter might have a means of expression and of influence.

There is a need, we think, of a readjustment of the teachers' status in the schools. This readjustment is certain to come later, if not in the near future, because of the growth of the democratic ideal in government and the certain recognition of the laborer as a more important factor in the control of industry.

Recent European events and the growth of socialism in the United States all point to the democratization of all forms of collective effort such as no one anticipated even a year ago. The change in school control should come voluntarily, we think, from superintendents and school boards and should be based on the value of the teacher's ability and professional experience. Anticipation is here a measure that will guide to a safe middle course and will return the teacher to the place of honor and influence which he enjoyed in the days when he and the pastor shared the privileges of the best educated men in the community.—*School Board Journal.*

BOOKS AND LITERATURE

THE HISTORY OF SCIENCE

The Living Past. A Sketch of Western Progress. By F. S. MARVIN. Third edition. Oxford, Clarendon Press. 1917. Pp. xvi + 296.

An Introduction to the History of Science. By WALTER LIBBY, M.A., Ph. D., Professor of the History of Science in the Carnegie Institute of Technology. Boston, Houghton-Mifflin Co. 1917. Pp. xi + 288. Price $1.50.

A Short History of Science. By W. T. SEDGWICK, Professor of Biology, and H. W. TYLER, Professor of Mathematics, at the Massachusetts Institute of Technology. New York, The Macmillan Co. 1917. Pp. xv + 474, with 9 plates. Price $2.50.

Studies in the History and Method of Science. Edited by CHARLES SINGER, with an introduction by SIR WILLIAM OSLER. Oxford University Press. 1917. Pp. xiv + 304, with 51 plates. Price 21 shillings.

The Casting-Counter and the Counting-board: A Chapter in the History of Numismatics and Early Arithmetic. By F. P. BARNARD, M.A., F.S.A. Oxford University Press. 1918. Pp. 358 + 63 full page plates.

Ptolemy's Catalogue of Stars, A Revision of the Almagest. By C. H. F. PETERS and EDWARD BALL KNOBEL. Carnegie Institution of Washington. 1915. Pp. iii + 207.

Ulugh Beg's Catalogue of Stars. Revised from all Persian Manuscripts existing in Great Britain, with a vocabulary of Persian and Arabic words. By EDWARD BALL KNOBEL. Carnegie Institution of Washington. 1917. Pp. 109.

William Oughtred, A great seventeenth-century teacher of mathematics. By FLORIAN CAJORI, Professor of the History of Mathematics, University of California. Chicago, Open Court Publishing Company. 1916. Pp. vi + 100. Price $1.00.

The history of science justifies and dignifies the teaching of science. By the presentation of the continuity of progress of all science from remote ages up to the present time the achievements of the scientists of the past, both the great and the small, are revealed as essential parts of a system; the science of today is appreciated as a living, growing organism, dependent upon the mass of workers in the various fields. By the presentation of the fundamental unity and interdependence of all the sciences, the necessity for a wide knowledge of science is made apparent. By the presentation of the universality of science as the product of all ages and all civilizations, the common property of all mankind and the universal medium of civilization, the study of science is appreciated as being human and vital, a great unifying and humanizing force knowing no bounds of time or space.

The history of science shows clearly how inevitable were the discoveries of even the greatest scientists, and how accidental, almost, the particular names associated with noteworthy discoveries.

Any work on the history of science should present the continuity, the unity and the universality of science, subordinating and harmonizing the details in such a manner that the progress of science may not be obscured by the details. Scientific knowledge is absolutely indispensable for this task, and equally indispensable is some real familiarity with scientific historical methods.

In 1910 there appeared a work which may properly be called a serious and well-considered attempt in the field of the history of science. "Die Naturwissenschaften in ihrer Entwickelung und in ihrem Zusammenhange," by F. Dannemann, a four-volume work published by Englemann, is by no means the first contribution to the history of science by the author. Dannemann is favorably known for his "Grundriss einer Geschichte der Naturwissenschaften," which appeared first in 1896. The first of the two volumes of this earlier work contained extracts from the works of great scientists of all times and all peoples; latterly this has been published under the title, "Aus der Werkstatt grossen Forscher." The second volume of the "Grundriss" constituted a connected history of science and has grown into the later four-volume work.

Particularly noteworthy is the ambitious project of the well known Italian writer on the history of the sciences, Aldo Mieli. He purposes to write the story of the development of scientific thought from the origins to the end of the eighteenth century. The first volume, "I Prearistotelici" (Florence, 1915), a work of great merit, augurs well for the success of the project.

In certain special departments of science there are works which would serve well as models for a work on the history of science as a whole. Sir Thomas Heath, who has done more than any other to make the science of Greece popularly known, published in 1913 a history of Greek astronomy: "Aristarchus of Samos, The ancient Copernicus, A history of Greek astronomy to Aristarchus together with Aristarchus's Treatise on the sizes and distances of the sun and moon," Oxford, 1913. Starting with the conceptions of the universe which are found in Homer and Hesiod, Heath traces in a masterly manner the progressive development of astronomical ideas and theories among the Greeks; part of this ground was covered by the other great exponent of the science of the Greeks, Paul Tannery, in his work, "Pour l'histoire de la science hellène, de Thalès à Empédocle," Paris, 1887, also a masterpiece. Gino Loria's contriutions to the history of Greek science are the works of a master in the field. The monumental work in five volumes by Pierre Duhem, entitled "Le Système du Monde," is another classic in the history of science; Ernest Mach's "History of Mechanics' is another production of the same type of excellence.

One may ask whether there is any characteristic which is common to these men who have produced standard works in the history of science. Such a common characteristic is

found in the fact that each of these authors began by making real contributions to the details of the history of some special science before attempting the larger and possibly more difficult task of giving a connected account of the development of the science as a whole.

It is possible that the author of the small, but notable, publication on "The Living Past" would himself be astonished to see it listed among works on the history of science. In truth this book gives a conspectus of the history of civilization, emphasizing the part which has been played by science in the development of our world; but the historians of the past have confined themselves so largely to political history that it seems desirable to call the attention of scientists to a work in which the rôle of the intellect in the development of civilization is adequately recognized.

The story of the "growth of a common humanity," with "science as a great collective and binding force," is the primary purpose which the author has in mind in "The Living Past." The chapters are entitled: Looking Backward, The Childhood of the Race, The Early Empires, The Greeks, The Romans, The Middle Ages, The Renascence and the New World, The Rise of Modern Science, The Industrial Revolution, The Revolution, Social and Political Progress after Revolution, and Looking Backward.

In general historians have not considered the developments among primitive races as in their field, since political institutions or social institutions, such as there were, have left little trace of themselves; the scientific development, when properly considered, tells the whole story. The achievements of the Egyptians and Babylonians in applied science, being known to man for so long a period in which the political history was absolutely unknown, have continued to enjoy a certain amount of attention in ordinary histories. The part of primitive man and of these early civilizations in our western civilization is well brought out in this work.

Greek scientific development, from Thales and his Egyptian teachers, down to Hipparchus and his Babylonian antecedents, is portrayed as a vital and fundamental part of the progress of civilization in Greece. In the chapters on Rome and The Middle Ages science plays, naturally, a smaller part.

The substantial achievements of the Arabs and the influence of Arabic science upon our western civilization are not adequately recognized. The Crusades and the founding of the universities are noted as the two great movements leading to the new age, the one representing the method of enlarging the mental horizon by travel and the other the method of study. Equally potent was the movement in science stimulated by the study and translation of the great Arabic works of science, combining also within itself the two principles of travel and study which are indeed fundamental stimulants to intellectual work.

The part of the mathematical sciences in the renascence is well brought out, and equally well the part which the mathematicians of Greece had almost directly in the new discoveries. The analytical geometry and the calculus are rightly sensed by Dr. Marvin as among the most noteworthy and most powerful discoveries of all time, and as marking the beginning of a new age. The theories of Darwin are shown to be applicable to many fields, illustrating "the continued progress of all human things by small and regular changes."

Any scientist will gain a new vision and new inspiration by the reading of this valuable work.

It is possibly worth noting that it has not been established that Johann Müller (Regiomontanus) "translated the works of Ptolemy and the 'Conics' of Apollonius into Latin," as stated on page 148.

The "Introduction to the History of Science," by Libby, is a book with the modest purpose of "taking advantage of the interests of youth from seventeen to twenty-two (and their intellectual compeers) in order to

direct their attention to the story of the development of the sciences." The continuity, the unity, and the universality of science are presented in a manner to interest the general reader, even one who might not be properly classed as among the "intellectual compeers" of youth from seventeen to twenty-two. Undoubtedly the most serious criticism which can be directed against this work is the absolute lack of balance which is only in a slight measure to be explained by the class of readers which the author had in mind. The artificial subdivisions of the work, stressing too much the biographical element, particularly where English or American scientists are involved, are unfortunate; the intellectual capacity of university students who would use such a book is sufficiently great to warrant a more logical and historically correct treatment. The bibliographical references are not worthy of the text; either they should be made of real significance or they should be omitted. The spirit of the work is good and it can be said that, in large measure, the author has achieved the aim which he has set for himself.

The first two chapters present the science of Egypt and Babylon and Greece as well as one could expect to have it within the range of some twenty-seven pages. The author takes too seriously, as many other writers do, the Egyptian love for the practical and the Greek contempt for the same. Surely the Egyptain problems on arithmetical and geometrical progressions, the problems in the Ahmes papyrus involving first-degree equations, and the later problems involving pure quadratics, were purely intellectual problems, not for any practical need; surely, too, we know that Archimedes and other Greek mathematicians made practical applications of the theorems which they developed. The point of the sphere and the cylinder on the tomb of Archimedes is not made at all clear. Archimedes took just pride in having discovered the formulas for the surface of the sphere and the volume of the sphere; the encircling cylinder was taken to give a convenient method for memorizing the formulas.

In another twenty-five small pages the history of science from Vitruvius to Francis Bacon is covered. This is certainly "going some." Ptolemy the geographer is mentioned, but not his geography; Hero and Pappus and many another are passed over in silence. Almost five pages are devoted to the Arabs. The author states that "the names of the great Arab astronomers and mathematicians are not popularly known to us; their influence is greater than their fame." But the students from "seventeen to twenty-two" could endure a few of these names which are well known to us (but possibly not "popularly"). Among the men whose achievements are cited anonymously are Al-Khowarizmi (algorism), the Beni Musa, Al-Hasan, Nasir ed-Din al-Tusi, and Ibn Junis; one could add without much seeking a whole list of other names of great Arabic scientists. It is not at all true that with the death of Averroës "the culture of liberal science among the Arabs came to an end." After that date Nasir ed-Din al-Tusi (1201–1274) developed the science of plane trigonometry, for which the credit is commonly given, incorrectly, to Regiomontanus; long after Averroës, in 1437, Ulugh Beg published his catalogue of stars, made at the observatory of Samarkand. However this section of the work is hardly worth detailed criticism.

To Francis Bacon more space is devoted than to Greece, and to his "Catalogue of the Particular Histories" more space than to the science of the Arabs. I would venture the assertion that without serious distortion of the historical development of scientific ideas this whole chapter could be omitted.

The discussion of Newton's achievements appears very properly in a chapter on "Co-operation in Science—The Royal Society." The intimate connection between the work of Newton and that of Kepler, Huygens, Halley, Hooke, Wren, Bullian and Picard is well brought out, in his connection Tycho Brahe and Copernicus should have been mentioned by name, and the importance of the Greek study of the conic sections for these develop-

ments might also well be specifically mentioned. No better illustration of cooperation in science can be found anywhere than in the story of the laws of the universe and their discovery. Newton's other contributions are slighted; particularly unfortunate is the omission of the calculus.

To Benjamin Franklin is devoted a chapter constituting more than one twentieth of this story of the history of science of all the world.

In the chapter on "The Scientist—Sir Humphry Davy" a little space might well have been devoted to the achievements of Michael Faraday.

A most interesting and instructive chapter is the one devoted to the discovery of Neptune, "by heaps of algebra" as, I believe, De Morgan observed.

Modern science and modern inventions receive due and proper recognition. The contributions of Americans to this field are undisputed and noteworthy. Some brief discussion of telegraph and telephone would add much to the chapter on Science and Invention, and the wireless and the submarine doubtless should appear somewhere in the discussion of notable inventions of man. The calculus and analytical geometry should certainly be included among the noteworthy discoveries of man.

The closing chapter on Science and Democratic Culture is well conceived. Truly the cultivation of the sciences does tend "to promote a type of culture that is democratic rather than aristocratic," and rightly taught science can be "the new humanity."

The index appears to be made somewhat carelessly; I have accidentally noticed the omission of Harvey's name (page 38, 73, 78–80, 85) and an incorrect reference to Geber as on page 177.

"A Short History of Science," by Tyler and Sedgwick, is presented to the reader in a form so attractive that it arouses the expectation of a work of a high order of excellence; unfortunately the content does not fulfill the promise of the form. The quotations facing the title page show that the authors have some conception of the purpose of the study of the history of science, but in the text itself the historical details are rarely presented in a manner to bring out the continuity, the unity, and the universality of science. Equally serious is the fact that the authors show no appreciation of historical values, citing secondary and too frequently second- or third-rate works at great length. In the mass of citations there are valuable ones, such as those from Eudemus, Theophrastus, Aristotle, Archimedes, Priestley, Maclaurin, but predominant are worthless, weak or pernicious citations; the method of writing a history of science by citation of any but original masterpieces of science has little to commend it. This work would have been out of date ten years ago for it shows little familiarity with the publications of this century.

The skeleton-outline of the work is commendable, and the distribution of space appears to be well-conceived. The illustrations are well chosen, as far as they go; but they are extremely limited for this type of work. The appendices contain material of real historical value with the exception of the list of reference works which is hopelessly inadequate.

The writer of this review will confine his detailed criticism largely to the fields of ancient and medieval science.

In discussing Babylonian arithmetic (pp. 26–27), the Babylonian zero symbol is unknown to these authors, in spite of the fact that it is mentioned in practically every modern treatise touching the mathematics of Babylon, and has been mentioned repeatedly in recent periodical literature.

The dependence of Greek science upon Babylon and Egypt is touched upon all too briefly; with modern authorities in this field, like Boll and Cumont, the authors are evidently unfamiliar. The statement (p. 43) that the Egyptian and Babylonian mathematics "was merely a tool crudely shaped to meet vital concrete needs" is refuted by the work on squares and cubes of the Babylon-

ians, by the work on first-degree and even second-degree equations of the Egyptians, and by the notable work on arithmetical and geometrical series of the Egyptians (which should have been mentioned, p. 34). For none of these developments was there any practical necessity, and this is true of a great portion of the work in the Ahmes papyrus.

The fundamental Pythagorean development of the "application of areas" is evidently not comprehended by the authors, as they note (p. 51), "a number of theorems depending on the application of one surface to another." A very little study of the theorems in question, Euclid I., 44, and Euclid VI., 26–29, and in Euclid's "Data," would reveal the fact that this theory is concerned always with the application of an area to a *line*, strange as this may appear to the neophyte in Greek science. Further study would show that this body of ideas is intimately connected with the construction of the pentagon, with the "golden mean," and with the irrational.

The statement (p. 67) that Hippocrates "made effective use of the *reductio ad absurdum* as a method of relating one proposition to another" is far from clear; further, no connection of Hippocrates with this method of proof is known. The discussion of the lunes of Hippocrates beyond the simplest case is also not clear, missing the point that the real genius and mathematical ability of this writer is displayed in the further solutions, not in the one which any beginner in geometry can follow. The notation chosen, in discussing the "insertion of two means" by Hippocrates, obscures the fact that Hippocrates paved the way for the solution of this problem using conic sections, a solution achieved by Menaechmus (p. 76); the connection between the two is not made.

Epicurus is mentioned (pp. 84–84), but no hint is given as to the teachings of his school nor their bearing on the history of science.

The fifth postulate of Euclid, the parallel postulate, is not now known as the twelfth axiom (p. 91), since it is not an axiom but a postulate. These words cause our authors trouble. The critical estimate of Euclid, eleven lines by the authors and some ninety lines of mixed quotations, will surely leave the student completely bewildered, for what is asserted is also denied, and vice versa. A single quotation from Heath or Tannery, recognized authorities in this field, would have been better than this mass of contradictory citations.

The quadrature of the parabola by Archimedes is not given in a form which would be intelligible to the uninitiated. The point is that the parabola is the limit of the sum of a series of triangles whose areas form a geometrical progression with ratio one-fourth Further it should be noted that this proposition was first proved by the famous "mechanical" method which is unfortunately not explained.

That Eratosthenes was an athlete (p. 108) is not a matter of historical record. True he was called "pentathlon," but that because of his versatility in learning. This amusing misinterpretation is quite common, being perpetrated even in Harper's "Dictionary of Classical Antiquities."

Hypsicles (p. 115) added only one book, the fourteenth, to Euclid's "Elements," not two.

Galen's biography appears twice (p. 113 and pp. 146–147), but in neither place is the real significance of Galen as an *experimental* physiologist mentioned; indeed the fact appears not to be known to the authors (p. 113 and p. 255).

Gow's estimate of Pappus (given pages 137–138) would need to be revised in the light of modern knowledge of this great Greek mathematician.

Contradictory estimates of Strabo, surely a great figure in the history of geography and of science, are given (pp. 145, 146 and 147). It is possibly a slip of the pen to refer to Ptolemy (c. 150 A.D.) as a "great predecessor" of Strabo (c. 50 B.C.), but to repeat that "mathematical geography well begun under Eratosthenes and Ptolemy becomes superficial and descriptive with Strabo and even with Posidonius" does violence to historical verities in

so many different ways that charity must cease. Strabo should precede Ptolemy under Greek and not under Roman science.

The chapter on Hindu and Arabian Science, The Moors in Spain, is probably the most deficient in extent, intent and content of any in the book. The references for reading are illuminating as to the type of research, or reading, which evidently preceded the composition of this chapter, mentioning Ball, Berry, Draper, Dreyer, M. Hume, March Philips and Gibbon. One valuable citation, from an original work of value, is taken from Bhaskara's "Lilavati," and is ascribed to Brahmagupta. The estimate of Arabic achievements in a long quotation (pp. 169–170) from one March Philips ("In the Desert") is absolutely false and fanciful, contradictory to other estimates given, by Berry, Wiedemann and Draper, but unfortunately supported by the brief and misleading summary of the authors (pp. 170–171).

The following chapter, Progress of Science to 1450 A.D., is also written upon the basis of extremely meager information. The arithmetic of Boethius, which should be mentioned as a translation of Nicomachus, has nothing whatever to do with computation with Roman numerals (p. 128). The summary on modern Hindu-Arabic, arithmetic is an absurd quotation from a thesis by Abelson, surely no authority in this field.

When the authors arrive at fairly modern science the ground is more solid under their feet. Here their eminent scientific abilities enable them to interpret in an interesting way the scientfiic movements of recent times.

The work may do some good in arousing an interest in science as a whole. But an immense amount of harm will be done by this work by the spread of absolutely false ideas concerning the development of science.

Does a great publishing house owe any duty to the public? It would appear that it does, and that a certain amount of blame must attach to the publishing house which presents to its patrons a work containing so much of misinformation.

The "Studies in the History and Method of Science" include, besides an interesting introduction by Dr. William Osler, the following monographs: The Scientific Views and Visions of Saint Hildegard (1098–1180), by Charles Singer, pp. 1–55; Vitalism, by J. W. Jenkinson, pp. 59–78, preceded by a brief biographical sketch of Dr. Jenkinson who was killed in action at Gallipoli; A Study in Early Renaissance Anatomy, with a new text; The Anothomia of Hieronymo Manfredi, transcribed and translated by A. Mildred Westland, by Charles Singer, pp. 79–164; The Blessing of Cramp-Rings; a Chapter in the History of the Treatment of Epilepsy, by Raymond Crawfurd, pp. 165–187; Dr. John Weyer and the Witch Mania, by E. T. Withington, pp. 189–224; The "Tractatus de Causis et Indiciis Morborum," attributed to Maimonides, by Reuben Levy, pp. 225–234; and Scientific Discovery and Logical Proof, by F. C. S. Schiller, pp. 235–289.

This volume of essays is a notable addition to the history of science, entirely apart from the fact that it gives the promise of many further contributions to his field. The editor of the volume, Dr. Charles Singer, and his gifted wife, are both well and favorably known for scholarly contributions to the history of the natural sciences and medicine in the middle ages. A group of students is working at Oxford under Dr. Singer, making researches particularly in the medieval field where so much remains to be done. Further, under the stimulus of Dr. and Mrs. Singer, special provisions favorable to research work in the history of science are being made at the Bodleian Library. The resources of this famous library are being used by a large number of writers prominent in the history of the sciences.

The opening essay of the "Studies," discussing Saint Hildegard, is a veritable model of excellence for a work of this nature. Twenty-five full page plates and nine figures provide the illustrative material which is so vital to the proper understanding of works in

natural science. The conceptions of geography, anatomy and astronomy of St. Hildegard are of particular interest as being remarkably free from Arabic influence.

So far as the "visions" are concerned, in which form the material of Hildegard's works came to her, this is doubtless partly the fashion at that time, as Dr. Singer states, and partly the same type of sudden inspiration which is common to students in many fields. Wm. Rowan Hamilton's sudden inspiration with regard to quarternions, and similar experiences described by Poincaré and common to mathematicians, scientists, artists and literary workers, were probably "visions" somewhat of the same kind.

The study of Manfredi's "Anothomia" (1490) is made with equal care.

The studies on Cramp-rings and on the witch mania are interesting contributions to the occult sciences, and to the conflict between science and superstition.

Mr. Levy's study shows that Maimonides wrote no treatise entitled, "Tractatus de Causis et Indiciis morborum." The worker in the field of Arabic and Hebrew science of the middle ages has many difficulties of the kind indicated by the common ascription to Maimonides of this work.

The studies by Dr. Jenkinson and by Mr. Schiller are concerned particularly with the philosophy of science.

The contribution to the history of arithmetic made by "The Casting-Counter and the Counting-Board," by Professor Barnard, is in every way up to the high standard set by the publications in the history of science of the Oxford Press. For more than three hundred years after the Hindu-Arabic arithmetic was known in Europe, computation continued commonly on the casting-counter with "jetons," closely akin to the earlier abacus-reckoning. The materials and the methods of this system of calculating, as explained by Barnard, are of interest to the medieval archeologist as well as to the student of the development of arithmetic.

Ulugh Beg (1393–1449), grandson of Tamerlane composed a number of works on astronomy and mathematics. In the preparation of his "Tables," of which the star catalogue is only a small portion, he recomputed tables of sines introducing refinements leading to a higher degree of accuracy than had been attained before his day.

The "Star Catalogue," composed towards 1437 A.D., was based upon the "Uranometria" of Abd al-Rahman al-Sufi (903–986). The Ilkhanic tables of Nasir Eddin al-Tusi, 1201–1276 A.D., who wrote the first systematic treatise on plane trigonometry, were also employed by Ulugh Beg.

The two star catalogues are included in a large list of notable contributions to science made possible by the funds of the Carnegie Institution. Both works are of fundamental importance in the history of astronomy and of science; each original catalogue represents not simply the effort of one man, but rather the product of a series of workers, many anonymous, covering a long period of time. Up to the time of Tycho Brahe, Ptolemy's list of stars "was practically the only source of information of the positions of the stars which the world possessed," as the more accurate list by Ulugh Beg was not commonly available.

In all thirty-three Greek, Latin and Arabic manuscripts of the Almagest, or portions thereof were employed by the two authors, both having the most exceptional qualifications for this type of scientific work. The earlier manuscript of the Almagest discovered is probably the Paris Codex 2389, of the ninth century, bearing the stamp of Henri IV. and once owned by Catharine de Medici; one copy of Gerard of Cremona's Latin translation, British Museum Codex, Burney 275, "belonged to Pope Gregory XI. (1370–1378) and was given by Clement VII. to the Duc de Berri in 1387." One Arabic Manuscript, British Museum Arabic Manuscript, Reg. 16, A. VIII., has written on the first page, "This book belonged to Sultan Ahmed ye Turkish Emp'r. . . ." Many other notable scholars, who

had probably a greater interest in the content of the Almagest than these rulers, are mentioned as having been occupied in one way and another with the Almagest; among these scholars should be mentioned the son of a caliph, the Arab Al Mamun (died 833), who made one of probably two Arabic translations which represent equal antiquity and even greater accuracy than the Greek manuscripts which are preserved.

Several full page plates, reproducing some of the earliest manuscripts add much to the interest and the value of the work.

The little booklet by Professor Cajori gives a delightful account of the life of that lover of mathematics, William Oughtred. The textbooks by Oughtred are particularly contributions to the teaching of algebra and trigonometry. His invention of the slide rule and his probable invention of the $\times$ as a symbol for multiplication are both noteworthy contributions; they indicate also Oughtred's interest in the general subject of arithmetical computation.

It is worthy of note for the growing recognition of the place of the history of science in American universities that the distinguished author has recently been made Professor of the History of Mathematics at the University of California.

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EDUCATIONAL RESEARCH AND STATISTICS

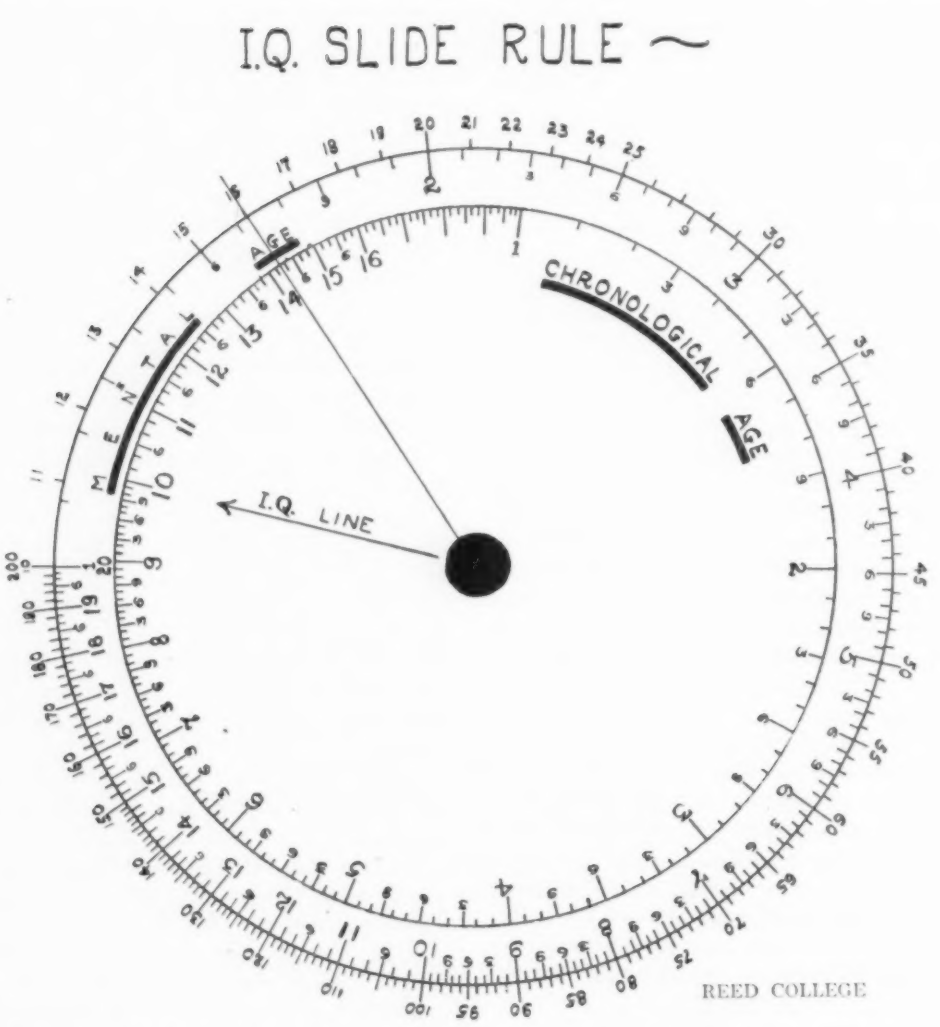
THE REED I. Q. SLIDE RULE

AMONG the lessons of which the war will make us conscious is the lesson of efficiency—an efficiency which will make for the highest personal development of each individual in society, no matter what his social, occupational or political status, no matter what his geographical location. This situation will bring to the front more than ever before the question of individual differences in mental capacity. For seven years now we have been hearing and reading of the importance of mental age for pedagogical progress, for an understanding of exceptional behavior on the part of children and adults, and wherever we come in contact with any serious problem of human behavior we are confronted with the question, "What is the intelligence development of this individual?" A consideration of mental age is essential if we are to suggest plans for training and developing each member of the community to his maximum usefulness.

Not only is it essential to know the mental age, but what is far more important, the ratio of mental age to chronological age, or, in technical terminology, the "intelligence quotient" or I.Q. (mental age divided by chronological age). Evidence is accumulating which indicates that for most people the I.Q. ratio remains constant throughout life and intelligence development through the years may very easily be predicted as early as five or six, if not earlier. And not only may the degree of intelligence at the various years be predicted but the rate and extent of school progress at the various grade levels as well. It is hoped that some day psychology will make the same connection with the problems of vocational success.

Mental testing has become so wide-spread, in schools, courts, reformatories, institutions for feebleminded, and now in the army and navy, that the need is great of eliminating the monotonous routine of figuring intelligence quotients, with its attendant evils of inaccuracy, loss of time, difficulty of checking without considerable additional labor, and waste motion. No one who has attempted the determination of I.Q.s by means of long division will fail to appreciate the value of a calculating device.

The Reed I.Q. Slide Rule is an instrument for the rapid calculation of intelligence quotients. The rule has three scales. From the center out, they are: (1) a chronological age scale (1 month to 16 months or 1 year to 16 years); (2) a mental age scale (1 month to 20 months or 1 year to 20 years); (3) an intelligence quotient scale (1 to 20 or 10 to 200). A celluloid indicator is attached to aid in setting one age above another correctly,



as well as to assist the accurate reading of the intelligence quotient (I.Q.). The "I.Q. Line" points to the desired I.Q. on the outside scale. (See the illustration.)

Only three moves of the hand are required from the moment the rule is set until the required I.Q. is read off. After a little practise, any I.Q. can be determined by means of this device in ten to fifteen seconds, and one hundred of them in less than twenty-five minutes. Not only is the instrument rapid; it also possesses the following advantages: it is absolutely accurate,—as accurate as any mathematical and mechanical instrument can be; it easily and rapidly checks; it is much less fatiguing than any other method thus far used; it prevents waste motion; it is easily understood and quickly learned; and it is inexpensive. To those who have had experience in purchasing psychological apparatus, the last point will have significance.

Finally, this slide rule may be used for any data other than ages, as long as the ratio desired is between numbers whose whole units are twelve, *e. g.*, feet and inches.

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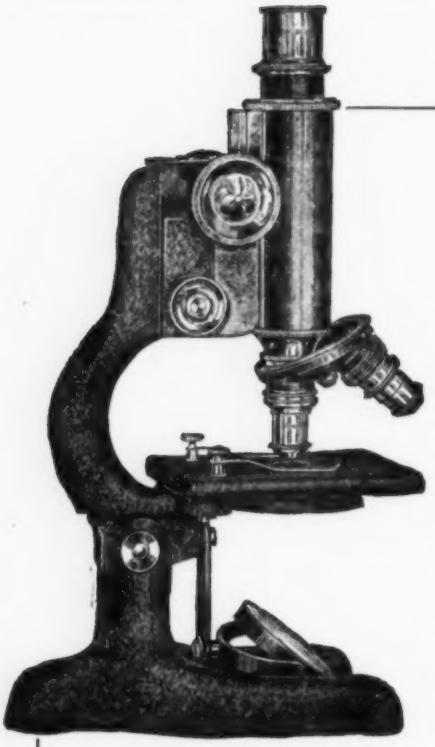

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